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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/879,905	06/14/2001	Yasuhiro Shimada	35.C15451	5559

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FITZPATRICK CELLA HARPER & SCINTO
30 ROCKEFELLER PLAZA
NEW YORK, NY 10112

EXAMINER	
YAM, STEPHEN K	

ART UNIT	PAPER NUMBER
2878	

DATE MAILED: 07/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/879,905	Applicant(s) SHIMADA ET AL.	
	Examiner Stephen Yam	Art Unit 2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 May 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,7 and 9-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7 and 9-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 9, 2003 has been entered. Claims 1-5, 7, and 9-25 are pending.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 17-19 (as dependent from Claim 1), and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Brezoczky et al. US Patent No. 5,351,229.

Regarding Claim 1, Brezoczsky et al. teach (see Fig. 5) a probe for detecting or irradiating light comprising a cantilever (49) supported at an end thereof by a substrate (19) (see Fig. 1), a hollow tip (51) formed at a free end of said cantilever, a microaperture (bottom end of 75) formed at the end of said tip, a groove (76, 61) formed inside said cantilever comprising a hollow waveguide (76) and a mirror (61), wherein the direction of the end of said tip is substantially perpendicular to the longitudinal direction of said cantilever (see Fig. 5), and said

mirror is an end face of the groove and reflects the light (46) transmitted in said hollow waveguide towards said microaperture.

Regarding Claims 17-19 (as depending from Claim 1), Brezoczsky et al. teach the probe in a surface observation (for information "reading"- see Col. 1, line 50 to Col. 2, line 5), exposure (for information "writing"- see Col. 1, line 50 to Col. 2, line 5), and information processing (see Col. 7, lines 21-24) system.

Regarding Claim 23, Brezoczsky et al. teach the mirror as having a slanted face (see Fig. 5).

Regarding Claim 25, Brezoczsky et al. teach (see Fig. 5) a light (46) toward the hollow waveguide reflected by the mirror as a propagating light passing throught the microaperture (see Col. 8, lines 11-15).

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 2-4, 9, and 17-19 (as dependent from Claims 2-4 and 9) are rejected under 35 U.S.C. 103(a) as being unpatentable over Brezoczsky et al.

Regarding Claims 2-4 and 17-19 (as dependent from Claims 2-4), Brezoczsky et al. teach the probe as taught in Claim 1, according to the appropriate paragraph above. Regarding Claims 17-19 (as dependent from Claims 2-4), the body of the claims does not specify any limitations

further defining a "surface observation apparatus", an "exposure apparatus", or an "information processing apparatus", so therefore the definition in the preamble cannot be given any patentable weight. Brezoczsky et al. do not teach the waveguide containing a V-shaped transversal cross section, or a trapezoidal cross section, or a U-shaped transversal cross section. It is well known in the art to use different-shaped waveguide cross sections to direct light as desired. It would have been obvious to one of ordinary skill in the art at the time the invention was made to construct the waveguide with a V-shaped, trapezoidal, or U-shaped transversal cross section in the probe of Brezoczsky et al., to efficiently guide light while conforming to desired dimensional and space specifications.

Regarding Claims 9 and 17-19 (as dependent from Claim 9), Brezoczsky et al. teach the probe as taught in Claim 1, according to the appropriate paragraph above. Brezoczsky et al. also teach (see Fig. 5) a lens (64) to focus the light traveling through the tip. Regarding Claims 17-19 (as dependent from Claim 9), the body of the claims does not specify any limitations further defining a "surface observation apparatus", an "exposure apparatus", or an "information processing apparatus", so therefore the definition in the preamble cannot be given any patentable weight. Brezoczsky et al. do not teach the mirror as a concave mirror. It is well known in the art to use a concave mirror in replacement of a separate mirror and lens to provide simultaneous reflection and focusing properties. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a concave mirror in the probe of Brezoczsky et al., to create a simpler, cost-effective, and more durable construction of the cantilever through fewer, less destructible parts.

3. Claims 5, 7, 17-19 (as dependent from Claims 5 and 7), and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brezoczsky et al. in view of Quate US Patent No. 5,354,985.

Regarding Claims 5, 7 and 17-19 (as dependent from Claims 5 and 7), Brezoczsky et al. teach the probe in Claim 1, according to the appropriate paragraph above. Regarding Claims 17-19 as depending from Claims 5 and 7, the body of the claims does not specify any limitations further defining a "surface observation apparatus", an "exposure apparatus", or an "information processing apparatus", so therefore the definition in the preamble cannot be given any patentable weight. Brezoczsky et al. do not teach the tip shaped as a square cone or the cantilever principally composed of silicon. Quate teaches a probe comprising a cantilever (see Fig. 1B) composed of silicon (see Col. 3, line 12), square hollow tip (see Fig. 6D), microaperture (see Abstract, line 5), and waveguide (23). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a square cone tip and a silicon cantilever as taught by Quate in the probe of Brezoczsky et al., to better angle the optical beam for greater beam confinement and less optical loss through the cantilever.

Regarding Claim 24, Brezoczsky et al. teach the probe in Claim 1, according to the appropriate paragraph above. Brezoczsky et al. do not teach a light toward the microaperture reflected by the mirror generating near field light in the vicinity of the microaperture. Quate teaches a probe comprising a cantilever (see Fig. 1B) composed of silicon (see Col. 3, line 12), square hollow tip (see Fig. 6D), microaperture (see Abstract, line 5), and waveguide (23), wherein a light (see Fig. 1D) toward the microaperture is near field light (see Col. 1, lines 19-24 and 42-45 and Col. 4, lines 7-11). It would have been obvious to one of ordinary skill in the art

at the time the invention was made to generate near field light as taught by Quate in the probe of Brezoczsky et al., to utilize the probe in a near-field scanning optical microscope (NSOM) to improve optical resolution through emission and detection of sub-wavelengths of light.

4. Claims 10-14, 16, and 20-22 (as dependent from Claims 10-14 and 16) are rejected under 35 U.S.C. 103(a) as being unpatentable over Quate US Patent No. 5,354,985 in view of Yamamoto et al.

Regarding Claims 10-12, 14, and 20-22 (as dependent from Claims 10-12 and 14), Quate teaches a probe comprising a cantilever (see Fig. 1B), a hollow tip (see Fig. 6D), microaperture (see Abstract, line 5), waveguide (23), and a mirror (slanted portion of (19)) being a slanted end face of the waveguide. Quate also teaches the formation of a hollow tip (Fig. 4A-4M) and the removal of a part of a substrate by etching to form a cantilever (Fig. 4L) for an optical probe. Regarding Claim 12, Quate further teaches the use of crystal-anisotropic etching (see Col. 8, lines 31-35) to etch the substrate of a cantilever probe. Regarding Claim 14, Quate teaches the use of a silicon-on-insulator (SOI) wafer as a substrate (see Col. 5, lines 55-58) and the etching of the SOI layer (see Col. 6, lines 12-13). Regarding Claims 20-22 (as dependent from Claims 10-12 and 14), the body of the claims does not specify any limitations further defining a "surface observation apparatus", an "exposure apparatus", or an "information processing apparatus", so therefore the definition in the preamble cannot be given any patentable weight. Quate does not teach the construction of the probe by working a substrate to form a groove and a mirror at an end of the groove therein and forming a flat plate-shaped covered portion on the groove. Yamamoto et al. teach (see Fig. 7) a probe comprising a cantilever (15), hollow tip (see Fig. 6b),

mirror (8) (see Fig. 3), microaperture (see Col. 2, lines 66-67), and hollow waveguide (see Col. 2, lines 15-16). Yamamoto et al. and Quate do not teach the working of a substrate to form a groove and forming a flat plate-shaped cover portion on the groove to form a hollow waveguide. It is well known in the art to etch a substrate and form a covering surface layer to produce a hollow waveguide within the substrate. It would have been obvious to one of ordinary skill in the art at the time the invention was made to produce the probe of Quate with the hollow waveguide of Yamamoto et al. by working a substrate to form a groove, forming a flat plate-shaped cover portion on the groove to form a hollow waveguide, forming a hollow tip having a microaperture, and removing a part of the substrate by etching to form a cantilever, to provide a simplified fabrication process for producing the optical probe and specifically, the cantilever and groove, to provide a waveguide with minimal optical loss.

Regarding Claims 13 and 20-22 (as dependent from Claim 13), Quate in view of Yamamoto et al. teach the method as taught in Claim 10, according to the appropriate paragraph above. Regarding Claims 20-22 (as dependent from Claim 13), the body of the claims does not specify any limitations further defining a "surface observation apparatus", an "exposure apparatus", or an "information processing apparatus", so therefore the definition in the preamble cannot be given any patentable weight. Yamamoto et al. also teach a surface treatment step to form a mirror surface state (see Col. 2, lines 64-65 and Col. 3, lines 12-18). It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a mirror surface state as taught by Yamamoto et al. in the method of Quate in view of Yamamoto et al., to construct a precise, well-defined mirror to provide minimal optical loss by maintaining optical confinement from the waveguide.

Regarding Claims 16 and 20-22 (as dependent from Claims 16), Quate in view of Yamamoto et al. teach the method as taught in Claim 10, according to the appropriate paragraph above. Quate also teaches the formation of a hollow tip (Fig. 4A-4M) and the removal of a part of a substrate by etching to form a cantilever (Fig. 4L) for an optical probe. Regarding Claims 20-22 (as dependent from Claim 16), the body of the claims does not specify any limitations further defining a "surface observation apparatus", an "exposure apparatus", or an "information processing apparatus", so therefore the definition in the preamble cannot be given any patentable weight. Quate and Yamamoto et al. do not teach the specific process of forming a film of tip material on a recess, transferring the tip material onto the opening, and etching the end of the tip to form the microaperture. It is common knowledge to form a material into a tip form and etch a microaperture for a cantilever, as using such a production method is well known in the art. It would have been obvious to one of ordinary skill in the art at the time the invention was made to create the tip and microaperture in the modified probe of Quate in view of Yamamoto et al. by forming the material into a tip form and etching the microaperture, to utilize a well-known and simple method of producing a tipped cantilever for confined optical emissions and collections.

5. Claims 15 and 20-22 (as dependent from Claim 15) is rejected under 35 U.S.C. 103(a) as being unpatentable over Quate in view of Yamamoto et al., further in view of Tsukamoto et al. US Patent No. 5,902,715.

Quate teaches a probe comprising a cantilever (see Fig. 1B), hollow tip (see Fig. 6D), microaperture (see Abstract, line 5), and waveguide (23). Quate also teaches the formation of a hollow tip (Fig. 4A-4M) and the removal of a part of a substrate by etching to form a cantilever

(Fig. 4L) for an optical probe. Regarding Claims 20-22 (as dependent from Claim 15), the body of the claims does not specify any limitations further defining a "surface observation apparatus", an "exposure apparatus", or an "information processing apparatus", so therefore the definition in the preamble cannot be given any patentable weight. Quate does not teach the construction of the probe by working a substrate to form a groove therein and forming a flat plate-shaped covered portion on the groove. Yamamoto et al. teach a probe comprising a cantilever, hollow tip, microaperture, and hollow waveguide. Yamamoto et al. also teach a forming of a metal film on the outer surface of the probe (see Col. 2, lines 64-65 and Col. 3, lines 12-18). Quate and Yamamoto et al. do not teach a cover portion formed by filling the groove with a resin layer. Tsukamoto et al. teach an optical waveguide with a surrounding cover portion formed by filling a groove with a resin layer (see Col. 50, lines 63-65). It would have been obvious to one of ordinary skill in the art at the time the invention was made to construct the waveguide of Quate in view of Yamamoto et al. using a photosensitive resin layer, as taught by Tsukamoto et al., to create the cover portion, so that the cover portion will effectively remain covering a majority of the groove, without requiring a complex etching method to retain the cover portion.

Response to Arguments

6. Applicant's arguments filed March 11, 2003 have been fully considered but they are not persuasive.

Regarding Applicant's arguments on the Brezoczsky reference, Applicant asserts that Brezoczsky does not teach a continuous space formed by both the hollows of the waveguide and the tip for easy optical connection and low light transmission loss, and that Brezoczsky does not

teach a groove comprising the hollow waveguide and the mirror where the mirror is an end face of the groove. Examiner asserts that Brezoczsky does teach a continuous space formed by the hollows of the waveguide and the tip, as seen in Fig. 5 where a laser beam traverses through the waveguide and reflects off the mirror. In addition, the claim language has no mention of "continuous space", "easy optical connection", or "low light transmission loss"- therefore, those limitations cannot be interpreted as within the scope of the claim. Also, Examiner asserts that Brezoczsky does teach a groove comprising the hollow waveguide and mirror, as seen in Fig. 5 where the groove is formed as the waveguide (76) and mirror (61) within an external surrounding (49).

Regarding Applicant's arguments on the Quate reference, Applicant argues that there is no relationship between the waveguide and mirror and that Applicant's slanted/concave mirror directs all the striking light to the aperture unlike Quate's mirror which loses optical connection efficiency. Examiner asserts that Quate teaches the mirror at the end of the waveguide, guiding light emitted from the waveguide to the tip, wherein the mirror is at a slanted face of the groove, as seen in Fig. 1D. In addition, the claim language of Claim 10 does not recite the efficiency of the optical connection, as in Applicant's arguments, and therefore, cannot be given patentable concern.

Regarding Applicant's arguments on the Yamamoto reference, Applicant argues that Yamamoto does not teach the waveguide having a hollow face, and that an additional portion, such as a dielectric substance, be arranged at an end portion of the waveguide. Examiner asserts that Yamamoto teaches the specifics of the waveguide for combination with Quate, and that

Quate teaches the integration of the mirror as an end face of the waveguide/groove, and therefore, combining the two references would yield the invention as claimed in Claim 10.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen Yam whose telephone number is (703)306-3441. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (703)308-4852. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7724 for regular communications and (703)308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

SY

SY
June 30, 2003

DAVID PORTA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800